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ABSTRACT

Based on the premise that cost measurement for a library can be performed in the same manner as for an industrial organization, this paper presents a hypothetical cost determination problem of a small company which produces bricks. A summary of the five steps taken to develop the various cost figures are: (1) Assign all cost items to the appropriate departments, and to functions within the departments if necessary. The total of these costs for each department constitutes the "direct costs" for that department. (2) Study the relationships among the various departments to reach a conclusion about the order of allocation to departments. (3) Identify a meaningful measure of output of the "service" departments in operational terms. This measure is called the allocation basis. (4) Perform the necessary step-by-step allocation computations to determine the full costs of the "producing" departments. (5) Determine any unit-cost figures desired by dividing the full costs by the output of the "producing" departments. (MF)

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Measuring Library Costs

by

Frank Mlynarczyk, Jr.
School of Industrial Administration

Paper presented at an Institute on Program Planning and Budgeting Systems for Libraries at Wayne State University, Detroit, Michigan, Department of Library Science, Spring 1968

LI 002261

Introduction

by
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The following papers were presented at an institute on Program Planning and Budgeting Systems for Libraries, held at Wayne State University under the Higher Education Act, Title IIB, in the spring of 1968.

The intent of the institute was to introduce administrators and finance officers of large libraries, public, state, and academic to the principles and procedures of PPBS.

Each participant in the institute brought with him the most recent budget document from his own library, and with the help of the institute staff, attempted to convert it into a PPBS presentation.

Measuring Library Costs

by
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PART I: Cost Determination Problem

Introduction:

You have been asked to determine the costs of operation of a small company that produces bricks. You are given some budget fugures (cf. EXHIBIT 1), an organization chart and floor plan (cf. EXHIBITS 2a. and 2b.), and a "spread sheet" (also called a "work sheet", or "working papers"; df. EXHIBIT 3) to assist you. The company, Detroit Brick Company, has six departments, as indicated in the organization chart. Two department produce one type of brick each, and are called Red Brick Department and White Brick Department, respectively. The other four departments are Administration, Maintenance, Stores, and Sales. Stores handles the supplies and materials used by the company, while Sales handles the sale of output of the the two "producing departments".

Your logical first step in carrying out your task is to carefully break down all the budget figures by department. This has already been done for you, as you will not in EXHIBIT 3, the spread sheet. (If it were not done for you, you would dig through the accounting records to ascertain the departments responsible for the cost items. *) Note that in EXHIBIT 3 the budget items and respective totals have been entered in the extreme left column of the spread sheet, and that these totals agree with the sum of the figures spread across the six columns.

The direct costs can now be totaled for each department. These figures represent the costs to run each department by itself. These figures are useful for numerous purposes, some of which will be mentioned later. The task is not complete, because it is frequently useful to determine how much it costs to produce and sell a brick, the output of the business.

The direct costs of a department indicate the cost to produce its output only if those direct costs represent the only cost inputs needed to produce the output of that department. Usually, a "producing" department requires the services of a "service" department, such as Administration, or Maintenance, to produce its output. In fact, the only reason for the existence of the "service" departments is to assist the producing departments in getting the goods out the door. Therefore, the costs of the service department are (indirect) costs for the producing departments.

The question that now arises is, how should the costs of the various service departments be charged to the Red Brick Department and the White Brick Department? It seems, off-hand, that the process would be somewhat arbitrary, since the interrelationships among the departments are rather ill-defined. In practice this is the rule rather than the exception, so judgment must be used to come to reasonable allocations.*

Allocation Process and Rationale:

An allocation method commonly used sequentially charges the costs of one department to the remaining department, until all costs have been allocated to the producing department. The order in which the service

*Sometimes allocations have to be made at this stage in the process, because, e.g., the accounting system may not break down cost items in enough detail; social security costs and group insurance frequently are not accounted for by department.

departments are allocated is predicated upon the notion that a department that "serves the remaining departments the most " should be allocated first.

Administration:

In the case of Detroit Brick Company we will argue that the Administration Department performs more services for the remaining departments than any other department. Now the problem is, upon what allocation basis should the $12,000 of direct costs be charged to the remaining departments? Several reasonable bases can be imagined: a) a per capita allocation, i.e., if department X has 14% of the employees excluding Administration employees, then X is charged with 14% of Administration direct costs, - rationale: efforts to be expended by Administration depend to a great extent on the sizes of the other departments; b) in proportion to relative time spent attending to various departments, which may bear no relationship with the number of employees in each department - rationale: efforts to be expended by Administration depend on nature of the other department functions rather than the number of people employed in them; after all, the various department heads bear the responsibility of managing their own employees; c) et al.

Let us suppose method b) is appropriate in this case, and that the percentages indicated in Exhibit 4 are appropriate.

Exhibit 4: Allocation of Administration Costs

Allocation basis: relative amount-of-time-spent-administering-departments

Department Charged	Relative %		Amount to be Allocated	Amount Charged
Maintenance	15%	x	$12,000	$1,800
Stores	5%	x	12,000	800
Sales	20%	x	12,000	2,400
Red Brick	30%	x	12,000	3,600

Department Charged	Relative %		Amount to be Allocated	Amount Charged
White Brick	30%	x	12,000	3,600
	100%			$12,000

These amounts should now be entered in a convenient place in Exhibit 3.

Maintenance

Totalling the direct costs of the Maintenance department and the allocated costs charged to it in Exhibit 3, we obtain a figure of $17,800. to be charged to the remaining four departments. The most common ~~allocation~~ basis used to distribute maintenance cost s is floor area, since it is generally the case that that the larger the building, the more the effort need to maintain it.

More and more frequently these days several different allocation bases are used simultaneously to allocate maintenance costs. Cleaning services are allocated on a floor area basis for reasons mentioned above, and heating and air-conditioning cost are allocated on a volume (cubic feet) basis.

Presuming a floor area basis is appropriate in this example, we can develop the figures in Exhibit 5.

Exhibit 5: Allocation of Maintenance Costs

Allocation basis: relative floor-area

Department Charged	Relative %		Amount to be Allocated	Amount Charged
Stores	10%	x	$17,800	$1,780
Sales	20%	x	17,800	3,560
Red Brick	40%	x	17,800	7,120
White Brick	30%	x	17,800	5,340
	100%			$17,800

These amounts should now be entered in a convenient place in Exhibit 5.

Stores

Totalling the direct plus allocated costs of Stores Department in Exhibit 3, we obtain a figure of $10,380. to be charged to the remaining departments. If all items handled, stored, and distributed by Stores Department require approximately equal effort in relation to dollar volume, then a reasonable allocation basis is the relative dollar-volume-of-supplies-and-materials-handled. (Such a basis would NOT be reasonable if Stores handled items of large value in relation to size, such as gold and steel: a pound of gold is worth about as much as two tons of low-grade steel, but surely the gold is not as much trouble to handle.)

Presuming a relative dollar-volume-of-supplies-and-materials-handled allocation basis is appropriate in this case, we develop the figures in Exhibit 6.

Exhibit 6: Allocation of Stores Costs

Allocation basis: relative dollar-volume-of-supplies-and-materials-handled

Department Charged		Relative %		Amount to be Allocated	Amount Charged
Sales*	$0./$10,000.	0%	x	$10,380	$ 00.
Red Brick	6,000/ 10,000.	60%	x	10,380	6,228
White Brick	4,000/ 10,000.	40%	x	10,380	4,152
		100%			$10,380

* It is assumed the supplies and expense figure for Sales Department is for advertising and promotion, items not handled by Stores. Therefore, no allocation is made from Stores to Sales.

These amounts should now be entered in Exhibit 3 in a convenient place..

Sales

The total of direct plus allocated costs of Sales Department amounts to $14,960. and is to be charged to the two brickmaking departments. Let us suppose each product line requires about half the time of the Sales Department to sell. This is conceivable, even though more red bricks are sold than white bricks are sold. (The hypothetical output of the two department is 1,000,000 red bricksand 700,000 white bricks.) It might be the case that red bricks are a standard item and are sold in large quantities, while white bricks are more of a specialty item sold in smaller quantities.

Using relative time-spent-selling as the allocation basis for Sales Department costs, we obtain the figures in Exhibit 7.

Exhibit 7: Allocation of Sales Costs

Allocation basis: relative time-spent-selling

Department Charged	Relative %		Amount to be Allocated	Amount Charged
Red Brick	50%	x	$14,960	$7,480
White Brick	50%	x	14,960	7,480
	100%			$14,960

These figures should be entered in Exhibit in a convenient place.

Summary

Upon completion of the Sales Department allocation, the full costs of producing and selling bricks have been determined. The average cost to produce and sell a red brick is

Full cost/hypothetical output - $55,428./1,000,000 bricks - $.055428/red.

For a white brick the figure is similarly developed;

Full cost/hypothetical output - $44,572./700,000 bricks = $.06374/white. These figures are obviously useful. If this company is to remain in business for a long time it must meet its full costs. Therefore, the developed figures are useful in providing a starting point for pricing decisions. Inter-period comparisons can also be made to determine if costs are rising, falling, or constant.

A summary of the steps taken to develop the various cost figures follows.

Outline of Steps Necessary to Determine the Various Cost Figures:

1. Assign all cost items to appreciate department (and to function within the department, if appropriate). The total of these costs for each department constitute the direct costs for the department.

2. Study the relationships among the various departments to come to a conclusion about the order of allocation of departments.*

3. Identify a meaningful measure of output of the "service" departments in operational terms. This measure is called the allocation basis.

4. Perform the necessary step-by-step allocations computations to determine the full costs of the "producing" departments.

5. Determine any unit-cost figures desired by dividing the full costs by the output of the "producing" departments.

*Cost allocations can be performed by slightly more complex means, viz., by the use of simultaneous linear equations, or by iterative procedures. For the former, see

J.L. Livingstone, "Matrix Algebra and Cost Allocation", The Accounting Review, (July 1968), pp. 503-508.

T.H. Williams and C.H. Griffin, "Matrix Theory and Cost Allocation", The Accounting Review, (July 1964), pp. 671-678.

N. Churchill, "Linear Algebra and Cost Allocations: Some Examples", The Accounting Review, (October 1964), pp. 894-904.

For the latter, see

Cost Handbook, 2nd. edition (Robert I. Dickey, ed., 1960), Sec. 8, p.38.

Detroit Brick Company

Exhibit 1: Hypothetical Budget

Wages	$ 80,000
Supplies	15,000
Materials	5,000
TOTAL	$100,000

Exhibit 2a: Organization Chart

Detroit Brick Company

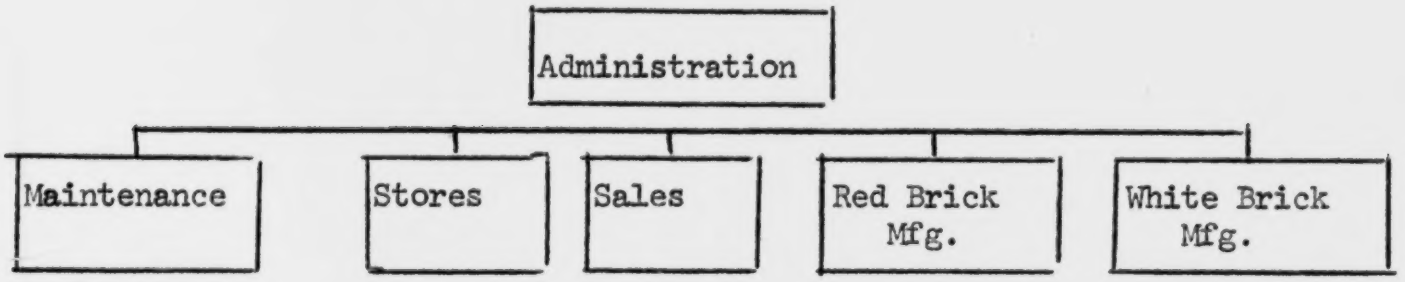
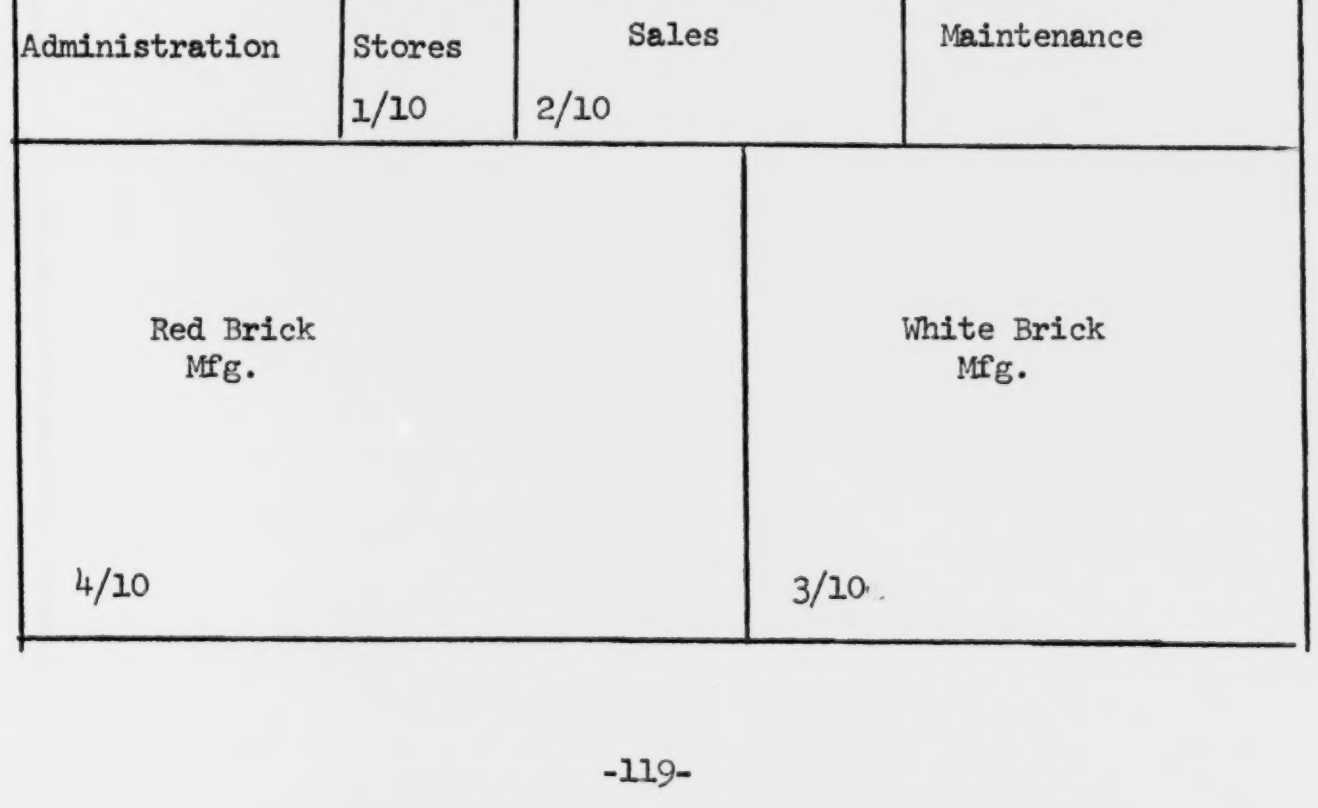


Exhibit 2b: Floor Plan

Detroit Brick Company



Detroit Brick Company

Exhibit 3 SPREAD SHEET

Budget Item and Amount		Department: Administration	Maintenance	Stores	Sales	Red Brick	White Brick
Salaries	$ 80,000	10,000	$ 10,000	7,000	8,000	25,000	20,000
Supplies	15,000	2,000	6,000	1,000	1,000 1/	3,000	2,000
Materials	5,000	-0-	-0-	-0-	-0-	3,000	2,000
TOTAL	$100,000	$12,000	$16,000	$8,000	$9,000	$31,000	$24,000
		12,000	(17,800) 1,800	600	2,400	3,600	3,600
				1,780	3,560	7,120	3,340
			(17,800)	(10,380)	-0-	6,228	4,152
					14,960	7,480	7,480
						55,428	44,572

1/ Assumed to be advertising expense, not handled by Stores.

PART II: Library Analogy

Cost measurement for a library can be performed for a library in the same manner as for an industrial organization. Refer now to Exhibit *8, which is simply Exhibit 3 completed, with the department names changed. Note that Stores has become Catalog Department, Sales has become Circulation Department, Red Brick Manufacturing has become History Department, White Brick Manufacturing has become Literature Department. Note also the budget item Materials has been changed to Books and Periodicals.

For this small library, Administration and Maintenance costs probably can be fairly allocated using the same bases as for the brick company. Catalog Department costs are probably fairly allocated on the basis of relative number-of-titles-cataloged. Circulation costs are probably allocated on the basis of relative volumes-circulated.

Exhibit 8 contains direct cost and full cost information on the Hypothetical Library, just as Exhibit 3 finally did for the brick company. It should be evident at this point that conventional cost-accounting procedures can be applied to develop cost information for libraries.

Hypothetical Library

Exhibit 8: SPREAD SHEET

Budget Item and Amount		Departments: Administration	Maintenance	Catalog	Circulation	History	Literature
Salaries	$ 80,000.	$ 10,000.	$ 10,000.	$ 7,000.	6,000.	25,000.	20,000
Supplies	15,000.	2,000.	6,000.	1,000.	1,000. *	3,000.	2,000
Books and Periodicals	5,000.	-0-	-0-	-0-	-0-	3,000.	2,000
TOTAL	$100,000.	$12,000.	$16,000.	$8,000.	$9,000.	$31,000.	$24,000
		(12,000.)	1,800.	600.	2,400.	3,600.	3,600
			$17,800.				
			(17,800.)	1,780.	3,560.	7,120.	5,340
				$10,380.			
				(10,380.)	-0-	6,228.	4,152.
					$14,960.		
					(14,960.)	7,480.	7,480.
				FULL COSTS		$55,428.	$44,572.

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Titles catalogued